## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT

Hiroshi HASEGAWA et al.

SERIAL NO.

09/057,684

FILED

April 9, 1998

TITLE

Refrigerator oils for use with chlorine-free fluorocarbon refrigerants

## DECLARATION

I, Kazuo TAGAWA, declare and state as follows:

I am a research worker further researching and improving products of the invention This is proposed claimed in the above -identified application.

I am forty-one years old. 2.

I graduated from Gunma University, Faculty of Engineering, Department of Synthetic 3. Chemistry Course with a Bachelor's degree of Engineering in 1986, finished the Master Course of 5/9/05 Engineering of Gunma University with a Master's degree of Engineering in 1988.

- I have been employed by NIPPON OIL CO., LTD. since April, 1988, during which 4. I have been engaged in researches in lubricating oils for compressors of refrigerators in the Central Technical Research Laboratory of said company.
- I have studied the Official Action, dated August 28, 2004, issued in the 5. above-identified application.
- In order to make clear that the refrigerator oils according to the present invention 6. achieve unexpected results in comparison with conventional ones, I made comparative tests as follows:

## **COMPARATIVE TESTS**

MAR-24-2005 14:10

To substantiate new and unexpected results for the mixed esters, which are included in the refrigerator oils of the present invention, based upon molar ratios of 1:3 and 3:1 for two carboxylic acids in which the first carboxylic acid is 2-ethylhexanoic acid and the second carboxylic acid is 3,5,5-trimethylhexanoic acid, I conducted further Comparative Tests as follows:

The refrigerator oils (Test Oil Nos. 1 and 2) which are included in the present invention each of which has a composition indicated in the following Table A, were prepared and then evaluated for their performances that are their insulating property, hygroscopicity and thermal and chemical stability by the same test methods as described in the present specification on pages 16-18. The Comparative Tests were carried out with the base oil alone without any epoxy additive. The results thus obtained are indicated in Table A.

Table A

															_
point	ව					-35		-45		-46		•		2	
		W				S <sub>o</sub>	change	Ž	change	Š	change	No	change	ž	change
Sealed glass tube tests	Satalyets	Fe				Luster	decrease	Luster	decrease	Luster	decrease	Luster	decrease	Luster	change decrease
	)	රී	***			No.	change	No	change	No	change	No	change	No	change
	Oil	color 4		t	4		9		4		4				
scopicity	@60°C,	30%	(%)			01.0	ET'A	0.19		0.19		0.19		0.19	
test	Amount	of	journal	worn	(gm)	ě	07	27		56		27		25	
. @25	(Gem)					10101	4.ZXIO1	100	3.8X1014	4.0x10H		4.1x1014		3.8x1014	
with R134s,	Miscible	Temp.	Range (C)			1	I.⊃~@.	17000		-28~CT**		-27~CT**		-32~CT**	
Viscosity	@100°C,	(s/zmm)					0.5		₩.	8.1		6.2		11.5	
ounds	Amount						•					•		•	
daroo	Kind						None		None	None		None		None	
Oils							-		-	-		2		60	
lio	No.						<u>.</u>		ķ,	Ex. 1		Comp.	Ex. 1	Comp	Ex. 3
	Oils compounds Viscosity with R134s, @25 test scopicity	Oils compounds Viscosity with R134s, @25 test scopicity Kind Amount @100°C, Miscible (Ocm) Amount @60°C, Oil Catalysts	Oils         compounds         Viscosity         with R134s, and the compounds         @25         test         test         copicity         Catalysts           Kind         Amount         @100°C, Miscible         (Qcm)         Amount         @60°C, oil         Catalysts           (mm²/s)         Temp.         of         30%         color         Ou         Re         Al	Oils         compounds         Viscosity         with R184s, all of the street of the stree	Oils         compounds         Viscosity         with R134s, all length         @25         test         copicity         Catalysts           Kind         Amount         @100°C, Miscible         (Ωcm)         Amount         @60°C, Oil         Catalysts           (mm²/s)         Temp.         of         30%         color         Ca         Fe         Al           Range (°C)         Range (°C)         journal         (%)         color         Ca         Fe         Al	Oils         compounds         Viscosity         with R134a, all of the R134a, and the R134	Oils         compounds         Viscosity         with R134a, (Gem)         dest         tost         scopicity           Kind         Amount         (G100°C, G10°C, G10°C, G11         Catalysts         Catalysts           Kind         Amount         (G0°C, G11         Catalysts           Range (°C)         Journal         (%)         Rep         Al           Worn         (mg)         (mg)         No         Luster         No	Oils         compounds         Viscosity         with R134a, all and the compounds         (Gcm) (Gcm	Oils         compounds         Viscosity         with R134a, all of Combounds         G25         tost         copicity         Amount G00°C, oil         Catalysts           Kind         Amount G100°C, Miscible (Gom)         Miscible (Gom)         Amount G60°C, oil         Oil         Catalysts           Range (C)         Range (C)         Igurnal (%)         Worn         Worn         No         Inster         No           1         None         90         30~CT**         4.2x10"         26         0.19         4         Inster         No         Inster         No         Inster         No	Oils         compounds         Viscosity         with R134a, aligned         G25         tost         scopicity         Amount G0°C, oil         Catalysts           Kind         Amount G100°C, miscible         (Gem)         Amount G6°C, oil         Oil         Catalysts           *         In None         (mm²/s)         Temp.         Amount G6°C, oil         Oil         Amount George         Ail           *         In None         In None         Gmg/s         30°CT**         4.2x10**         26         Oil9         Amount G6°C, oil         Ail         A	Oils         compounds         Viscosity         with R134a, G25         feat         teat         scopicity         Amount G00°C, G11         Catalysts           Kind         Amount G100°C, Miscible         (Gem)         Amount G60°C, G11         Catalysts         Catalysts           Range (°C)         Range (°C)         iournal G0°C, G11         Ca         Fe         Al           None         S         S         CT**         CT**         CT**         CT**         No         Catalysts         Al           I         None         S         S         Color         CO         Catalysts         Al         No         No         Al           I         None         S         S         Color         CG         Color         Catalysts         Al         Al         Catalysts         Al         Al	Oils         compounds         Viscosity         with R134a, G25         fast         test         scopicity         Amount G00°C, G11         Catalysts         Amount G00°C, G11         Catalysts           Kind         Amount G100°C, Miscible         Miscible         (Acris of the control of the compound of the control of the contr	Oils         compounds         Viscosity         with R134a, right         @26         tast         scopicity         Catalysts           Kind         Amount         @100°C         Miscible         (Ωcm)         Amount         660°C         Oil         Catalysts           Index (min-ls)         Temp.         Amount         (Ωcm)         Amount         (Ωcm)         Amount         (Ωcm)         Amount         (Ωcm)         Amount         (Ωcm)         Amount         (Ωcm)         (Ωcm)<	Oils         compounds         Viscosity         with R134a, Gloch         G25         tost         coppicity         Amount G60°C, Glor         Oil G60°C, G10°C, G10	Oils         Compounds         Viscosity         with R184a, all of the compounds of the compound of the co

Note: Test oil No. 1\* C8: C9=1mol: 3mol Test oil No. 2\* C8: C9=3mol: 1mol

CT\*\*: Critical temperature of HFC-134a (102°C)

As is apparent from the results indicated in Table A, the refrigerator oils (Test Oil Nos. 1 and 2) each of which contains molar ratios of 1:3 and 3:1 for two carboxylic acids in which the first carboxylic acid is 2-ethylhexanoic acid and the second carboxylic acid is 3, 5, 5-trimethylhexanoic acid, are excellent in pour point temperatures, which exhibit not higher than -10°C, as well as in any of insulating property, hygroscopicity and thermal and chemical stability, like in Examples 1 and 2 according to the present invention indicated in Table 1 of the present specification on page 19.

As clearly described in the present specification on page 11, lines 6-14, the refrigerator oils according to the present invention consisting essentially of a tetraester of pentaerythritol with both 2-ethylhexanoic acid and 3,5,5-trimethylhexanoic acid as the base oil should have such viscosity and pour point as those which are normally suitable for an ordinary refrigerator oil. In addition, they should have a pour point of not higher than -10°C, preferably -20°C to -80°C, to prevent solidification at a low temperature. Therefore, it is critical to a fluid composition for a refrigerator oil to have a low pour point.

As is apparent from the results indicated in Table A, Test Oil Nos. 1 and 2, and Example 1 are extremely low in the pour point as compared with those of Comparative Examples 1 and 3 and therefore, the fact that the compositions resulting from the mixed esters would, have a lower pour point than the individual esters would not have been expected by a skilled artisan.

As is also apparent from the results indicated in Table A, Test Oil Nos. 1 and 2; and base oil 1 of Example 1 each have extremely low pour point as compared with those of Comparative Examples 1 and 3 (Base oil 2 and 3) and therefore it would not have been expected by a skilled artisan that the compositions resulting from the mixed esters would have a lower pour point than the individual esters.

I further state that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Dated this _	day of	, 2005
Signature:		
	Kazuo TAGAW	A

AT 1753



PATENT

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:

Hiroshi HASEGAWA, et al.

SERIAL NO.:

09/057,684

GROUP: 1753

FILED:

APRIL 9, 1998

EXAMINER: A.D. DIAMOND

TITLE:

FLUID COMPOSITION CONTAINING REFRIGERATOR OILS AND

CHLORINE-FREE FLUOROCARBON REFRIGERANTS

LETTER ENCLOSING REVISED DECLARATION

ta enter

to enter AM

AV) 5/6/05 MAIL STOP: AF

Commissioner for Patents P.O. Box 1450

Alexandria, VA 22313-1450

Dear Sir:

This is in response to the Advisory Action from the Patent Examiner in charge of the above-identified patent application dated March 15, 2005. In this Advisory Action, the Patent Examiner stated that the previously filed Declaration of Mr. Tagawa was not persuasive for various reasons.

The enclosed revised Declaration of Mr. Tagawa has been modified in order to contain all of the required further information